Using the Centillion EtherSpeedII Switch Modules

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Preface

This guide provides an overview of the Nortel Networks™ Centillion™ EtherSpeed II™ 10/100BASE-T 20-Port Switch Module and the Centillion EtherSpeedII 100BASE-FX 16-Port Switch Module, and information about installing the switch modules.

Instructions to configure both EtherSpeedII switch modules is described in *Using SpeedView 4.2 for Windows* and *Release Notes for the Centillion Platform Release 4.1.2*. For more information about this topic, see "Related Publications" on page xvi.

In this guide, the Centillion EtherSpeedII 10/100BASE-T 20-Port switch module and the Centillion EtherSpeedII 100BASE-FX 16-Port switch module are also referred to as either EtherSpeedII switch modules or as switch modules.

Before You Begin

This guide is intended for local area network administrators who are responsible for installing, configuring, or maintaining a network and have the following background:

- Familiarity with Ethernet network administration

- Familiarity with the tools and procedures for installing and operating sensitive electronic equipment

- Understanding of Nortel Networks network management concepts and terminology

Related Publications

For information about EtherSpeedII switch modules, refer to the following related publications:

- *Using SpeedView 4.2 for Windows* (Part number 893-891-E)

  Describes this application, which is used for configuring the module.

- *Release Notes for the Centillion Platform Release 4.1.2*
  (Part number 203315-C)

  Describes updates to SpeedView for the 4.0 software release.

- *Reference Guide for the Centillion Command Line Interface 4.2*
  (Part number 893-00985-D)

  Describes setup and configuration procedures for Centillion™ switches using the command line interface.

- *Installation and Reference for the Centillion 50 and 100 Chassis*
  (Part number 893-894-C)

  Provides installation information for the Centillion 50™ and Centillion 100™ chassis.

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Chapter 1
Overview of the EtherSpeedII Switch Modules

This chapter introduces the Centillion EtherSpeedII 10/100BASE-T 20-Port Switch Module and the Centillion EtherSpeedII 100BASE-FX 16-Port Switch Module, and includes information about the following topics:

- Overview of the switch modules (this page)

- Features of the switch modules (page 1-2)

- Physical description of the switch modules (page 1-4)

- Switch configuration and management (page 1-7)

Overview of the Switch Modules

The EtherSpeedII 10/100BASE-T 20-Port Switch Module provides 20 RJ-45 10/100 megabit per second (Mb/s) autonegotiation ports that support servers, routers, or dedicated connections to users (Figure 1-1). These switch modules can also support multiple users through a shared-media hub connection to a port.

The EtherSpeedII 100BASE-FX 16-Port Switch Module provides 16 MT-RJ 100 Mb/s fiber ports for connections that support connections to other 100BASE-FX devices, for example, switches, servers, and routers.

Each switch module is installed in a single slot of a Centillion 50/100 chassis. You can use SpeedView™ network management software to configure and manage the modules.
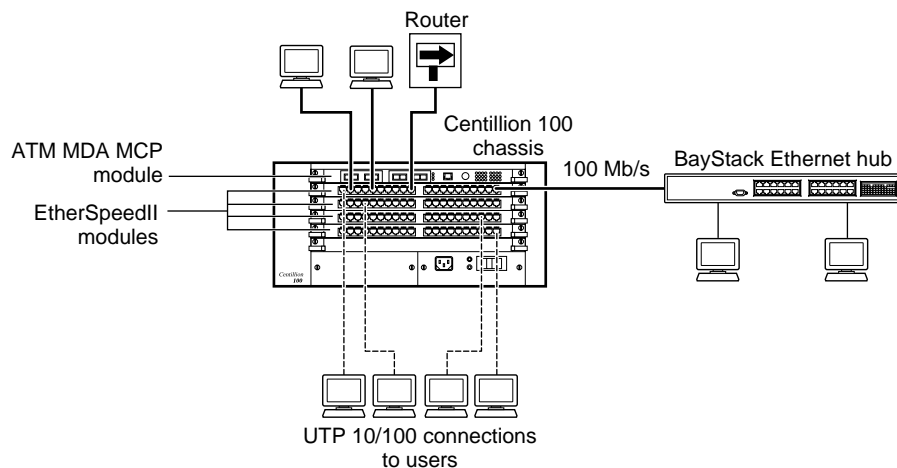
Figure 1-1.   EtherSpeedII Switch Modules in a Network Center

→ **Note:** You can use Category 3 UTP cable only for fixed 10 Mb/s port operation, not for 100 Mb/s or 10/100 autonegotiating port operation.

Features of the Switch Modules

The Centillion EtherSpeedII 10/100BASE-T 20-Port Switch Module and the Centillion EtherSpeedII 100BASE-FX 16-Port Switch Module offer the following features:

• Wire-speed, port-to-port, packet transfer

• Single-slot design to fit into the Centillion 50/100 chassis

• Autonegotiation of Ethernet 10/100 Mb/s speed (EtherSpeedII 10/100BASE-T switch module only)

• Layer 2 MAC address-based switching

• Local frame switching, module-to-module switching, backplane switching, and riser switching

• 200 MHz RISC processor

- 20 RJ-45 UTP network interface connectors
  (EtherSpeedII 10/100BASE-T switch module only)

- 16 MT-RJ fiber connectors (EtherSpeedII 100BASE-FX switch module only)

- Front-panel LEDs to indicate port status

- Port-based virtual LANs (VLANs)

- Protocol-based VLANs

  Protocol-sensitive VLANs classify packets based on protocol types. Most customers have multiple protocols per LAN segment, so a switch port needs to support multiple VLANs based on different protocol types. This feature allows you to separate data based on protocols and not on physical limitations.

- IEEE 802.1Q tag recognition support

  EtherSpeedII switch modules support recognition of VLAN tagged frames based on IEEE 802.1Q tags. Frames entering an EtherSpeedII switch module port that contain an 802.1Q tag are mapped to a corresponding VLAN. Based on the final destination, the frame is sent as either an Ethernet-type frame or an 802.1Q VLAN tagged frame. VLAN membership can be assigned by any combination of port with either tag or protocol.

- Support for IEEE 802.1d Spanning Tree

- Content-addressable memory (CAM) support for 8192 entries

- Port steering/port mirroring

- Input and output filtering supported by switching software

- Hardware support for IP multicast

- Support for RMON Management Information Base (MIB)

  — Ethernet Statistics Group

  — Ethernet History Group

  — Ethernet Alarm Group

  — Ethernet Event Group

- Ability to install, remove, and replace a module in an operational chassis
  (hot-swap)

- Hardware Assist Multi-Protocol Over ATM (MPOA)

MPOA is the ATM Forum standard that specifies a method to efficiently transport intersubnet unicast data in a LAN emulation (LANE) environment. MPOA uses LANE and Next Hop Resolution Protocol (NHRP) processes to allow direct shortcut virtual channel connections (VCCs) to be established for intersubnet communication without requiring passage through a router. The intrasubnet communication continues to be supported over LANE. For IP, Nortel Networks has adopted MPOA as the standard to implement layer 3 switching in an ATM network.

- Improved performance in segmentation and reassembly (SAR) performance to 3.2 gigabits per second (Gb/s).

- MultiLink Trunking (MLT)

Physical Description of the Switch Modules

The EtherSpeedII 10/100BASE-T switch module (Figure 1-2) consists of a printed circuit board with a metal module faceplate. The switch module includes captive retaining screws and inserter/extractor levers on the top and bottom of the front panel.
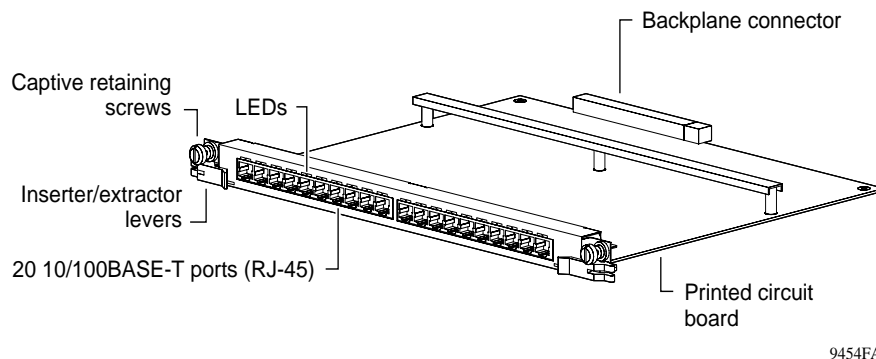

9454FA

Figure 1-2.   EtherSpeedII 10/100BASE-T 20-Port Switch Module

The EtherSpeedII 100BASE-FX switch module (Figure 1-3) consists of a printed circuit board with a metal module faceplate. The module includes captive retaining screws and inserter/extractor levers on the top and bottom of the front panel.
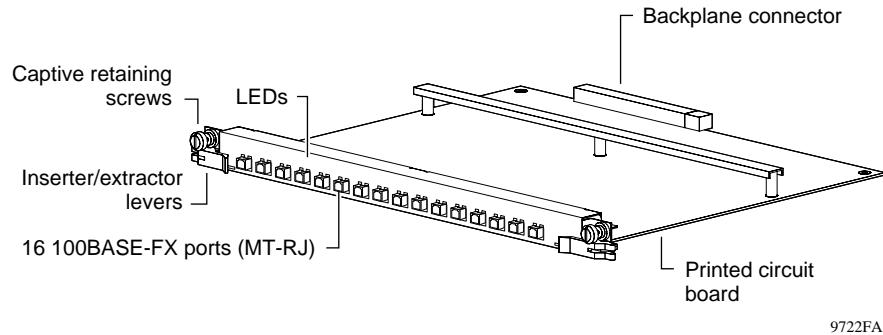

Backplane connector

Captive retaining screws

LEDs

Inserter/extractor levers

16 100BASE-FX ports (MT-RJ)

Printed circuit board

9722FA

Figure 1-3.   EtherSpeedII 100BASE-FX 16-Port Switch Module

Each switch module occupies one slot in a Centillion 50/100 chassis. In a Centillion 100 chassis, you can install a maximum of either:

- Five EtherSpeedII switch modules and one master control processor (MCP) switch module

- Four EtherSpeedII switch modules and two MCP switch modules

In a Centillion 50 chassis, you can install a maximum of two EtherSpeedII switch modules and one MCP switch module.

Note: See Appendix B, "Cables and Connectors," for more information about wiring and pin assignments.

LED Displays on the Switch Modules

LEDs on a switch module indicate port status. Figure 1-4 illustrates the front panel of an EtherSpeedII 10/100BASE-T switch module.
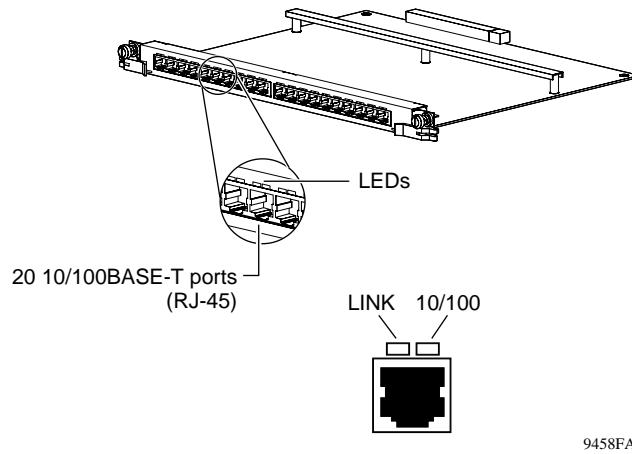

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Figure 1-4.   LEDs on the EtherSpeedII 10/100BASE-T Switch Module

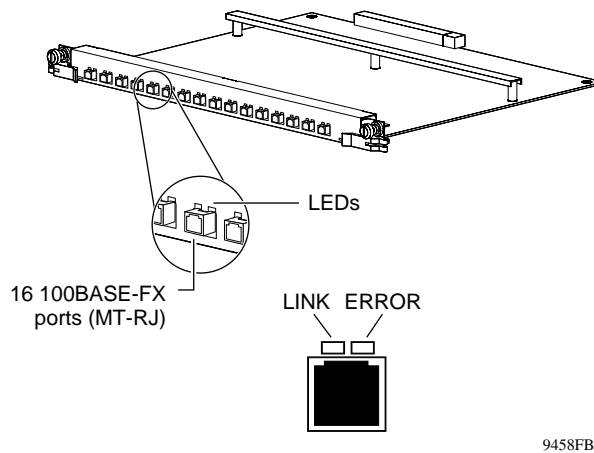Figure 1-5 illustrates the front panel of an EtherSpeedII 100BASE-FX switch module.

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Figure 1-5.   LEDs on the EtherSpeedII 100BASE-FX Switch Module

➡ **Note:** For more information about LEDs, refer to <u>Appendix C, "LED Displays on the EtherSpeedII Switch Modules</u>."

Switch Configuration and Management

You manage and configure EtherSpeedII switch modules through access to an installed MCP module in the Centillion 50/100 chassis with the following network management applications and features:

- Network management applications such as SpeedView and Optivity®
- Command line interface (CLI)
- Simple Network Management Protocol (SNMP) agent with Centillion MIB extensions
- Trivial File Transfer Protocol (TFTP) support
- Spanning Tree Protocol support
- VLAN support
- Filtering
- Hot-swapping capability

Network Management Applications and Features

EtherSpeedII switch modules support the following applications and features to configure and manage your network.

SpeedView

SpeedView is a network management application that runs on Windows® 95 or Windows 98 and Windows NT® and provides a graphical user interface to set up your switch. SpeedView allows you to monitor and control network traffic and to perform advanced operations such as filter configuration. For more information about SpeedView, refer to *Using SpeedView 4.2 for Windows* and *Release Notes for the Centillion Platform Release 4.1.2.*

Optivity

The Optivity Network Management System™ (NMS) provides enterprise-wide configuration and monitoring support for the Centillion 50/100 chassis switches. SpeedView provides configuration support when integrated with Optivity NMS. Expanded View™, OmniView™, Network Atlas™, Threshold Manager™, and other Optivity applications provide comprehensive monitoring and troubleshooting support. For more information about Optivity network management software, refer to your Optivity documentation.

Command Line Interface

The Centillion command line interface (CLI) provides an out-of-band interface for the initial setup of basic configuration parameters such as IP address and bridging mode. For more information about the CLI structure and commands, refer to *Reference Guide for the Centillion Command Line Interface 4.2*.

MCP Modules

Each EtherSpeedII switch module maintains its own switch tables for directing traffic. A central supervisor, the master control processor (MCP), consolidates these distributed tables into master tables that are accessible to other modules within a chassis or within a network of System 5000 hubs or Centillion switch modules. The MCP also handles the switch-wide housekeeping functions such as network management.

SNMP MIB Support

The Centillion switch modules support a Simple Network Management Protocol (SNMP)-compatible agent with private MIB extensions. Built-in SNMP agent support ensures compatibility with existing network management tools. The MCP modules support MIB-I and MIB-II (RFC 1213) standards that provide access to detailed management statistics.

Using SpeedView, you can configure SNMP traps to be generated automatically for conditions such as unauthorized access attempts or changes in operating status on individual ports.

TFTP Support

Trivial File Transfer Protocol (TFTP) is a supported Transmission Control Protocol/Internet Protocol (TCP/IP) service you can use to download software and configuration information to the MCP module memory. TFTP allows you to transfer an updated switch agent and configuration files from a remote server to flash memory. You can perform a transfer over the network or through a serial connection to the installed MCP module.

Spanning Tree Protocol 802.1d Support

The EtherSpeedII switch module software supports the Spanning Tree Protocol as specified in the IEEE 802.1d standard. The Spanning Tree Protocol is implemented to detect and eliminate logical loops in a bridged or switched network. When multiple paths exist, the spanning tree algorithm configures the network so that a bridge or switch uses only the most efficient path. If that path fails, the protocol automatically reconfigures the network to make another path become active, thus sustaining network operations.

Support for Virtual LANs

Using an EtherSpeedII switch module, you can group one or more physical ports to form a virtual LAN (VLAN) that constitutes a single broadcast domain.

VLANs are formed when broadcast domains are configured across multiple switches. Each Ethernet segment is an independent physical segment with its own collision domain, but all segments within a VLAN appear to the user as a broadcast domain.

Filtering

Filtering capabilities for the EtherSpeedII switch modules are implemented in system hardware and controlled by system software. Refer to the appropriate Centillion release notes for descriptions of the supported filtering capabilities, features, and availability.

Hot-Swapping Capability

You can insert EtherSpeedII switch modules into or remove them from a chassis without interrupting service to other modules within the Centillion 50/100 chassis. This feature is called "hot-swapping."

Caution: Be sure to remove cables from all ports on the module, or disable all the ports through the management interface, prior to hot-swapping.

10/100 Mb/s Autonegotiation Ports

The EtherSpeedII 10/100BASE-T switch module contains 20 10/100 Mb/s UTP autonegotiating Ethernet ports with shielded RJ-45 connectors. The RJ-45 connectors accept Category 3 or 5 unshielded twisted pair (UTP) cable or shielded twisted pair (STP) cable and are wired as MDI-X ports to connect end stations to patch panels without using crossover cables.

Note: See Appendix B, "Cables and Connectors," for information about wiring and pin assignments.

Chapter 2
Planning a Network with
EtherSpeedII Switch Modules

Installing the EtherSpeedII 10/100BASE-T or EtherSpeedII 100BASE-FX switch modules in a network can significantly improve LAN performance. This chapter provides information to help you plan a network that uses either or both of these modules. The chapter includes the following topics:

- Connecting the EtherSpeedII Switch Modules to Ethernet hubs and network devices (this page)

- Typical network configuration examples (page 2-2)

- Factory-set and predefined configurations (page 2-10)

➡️ **Note:** Follow the basic guidelines in Appendix A, "Technical Specifications," and Appendix B, "Cables and Connectors," when you plan a network using EtherSpeedII switch modules.

Connecting the EtherSpeedII Switch Modules to Ethernet Hubs and Network Devices

This section provides information on connecting EtherSpeedII switch modules to Ethernet hubs and network devices.

EtherSpeedII 10/100BASE-T Switch Module

You connect the ports of the EtherSpeedII 10/100BASE-T switch module to the front panel, wired as MDI-X connections. This wiring allows you to use a straight-through cable between the switch module and the patch panel.

To connect the ports on the patch panel to another Ethernet switch or an Ethernet hub, follow these guidelines:

- Personal computers (PCs) and servers typically have network interface cards (NICs) that are configured as MDI connections. To connect these devices, use a straight-through cable.

- Hubs and other switches typically have connectors that are configured as MDI-X. Some hubs and switches have ports that are set by a toggle switch for either MDI or MDI-X operation.

  — To connect a port set for MDI to the EtherSpeedII switch module port, use a straight-through cable.

  — To connect a port set for MDI-X to the EtherSpeedII switch module port, use a crossover cable.

→ **Note:** For connector specifications for MDI and MDI-X ports, refer to Appendix B, "Cables and Connectors."

EtherSpeedII 100BASE-FX Switch Module

You connect the EtherSpeedII 100BASE-FX switch module ports to Ethernet hubs and network devices using MT-RJ patch cables as appropriate for your cabling environment.

→ **Note:** Because multimode fiber connections do not autonegotiate, the mode of the devices at both ends of a link must be identical (HDX or FDX).

Network Configuration Examples

The EtherSpeedII 10/100BASE-T switch module and the EtherSpeedII 100BASE-FX switch module are adaptable switches suitable for use in wiring closets or network centers in conjunction with the Centillion 50/100 chassis. Figure 2-1 shows an example of the EtherSpeedII switch modules in a sample network configuration.

This section describes the following Ethernet switching applications:

- Dedicated ports for servers (page 2-4)
- Replacement for a bridge port (page 2-5)
- Desktop switch with ATM uplinks in a wiring closet (page 2-6)
- Segment switch in a wiring closet with ATM uplinks to a network center switch (page 2-7)
- Desktop switch and frame-to-cell converter (page 2-8)
- MultiLink Trunking (page 2-9)
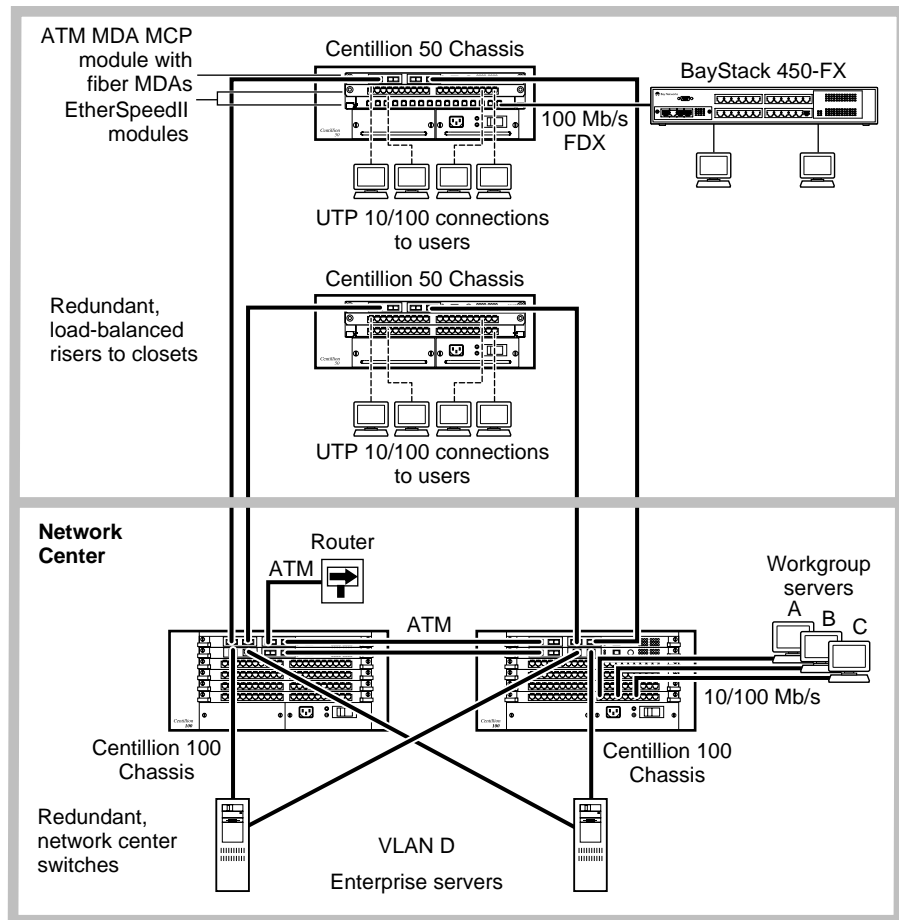
9466EB

Figure 2-1. **Network Example**

Giving a Server a Dedicated Port

Moving a server from a 10 Mb/s shared-media connection to a dedicated port on the EtherSpeedII 10/100BASE-T switch module or the EtherSpeedII 100BASE-FX switch module improves server response time and increases throughput capacity. For even higher performance, upgrade the server to 100 Mb/s and the switch modules can autonegotiate for 100 Mb/s.

In Figure 2-2, the "Before" example shows clients and servers sharing the same network segment. The "After" example shows the same clients assigned to different segments through a shared hub (either 10/100 Mb/s or directly connected) and the original servers connected to switch ports on a Centillion 50 chassis. In addition, two servers have been added through 10/100 Mb/s connections.
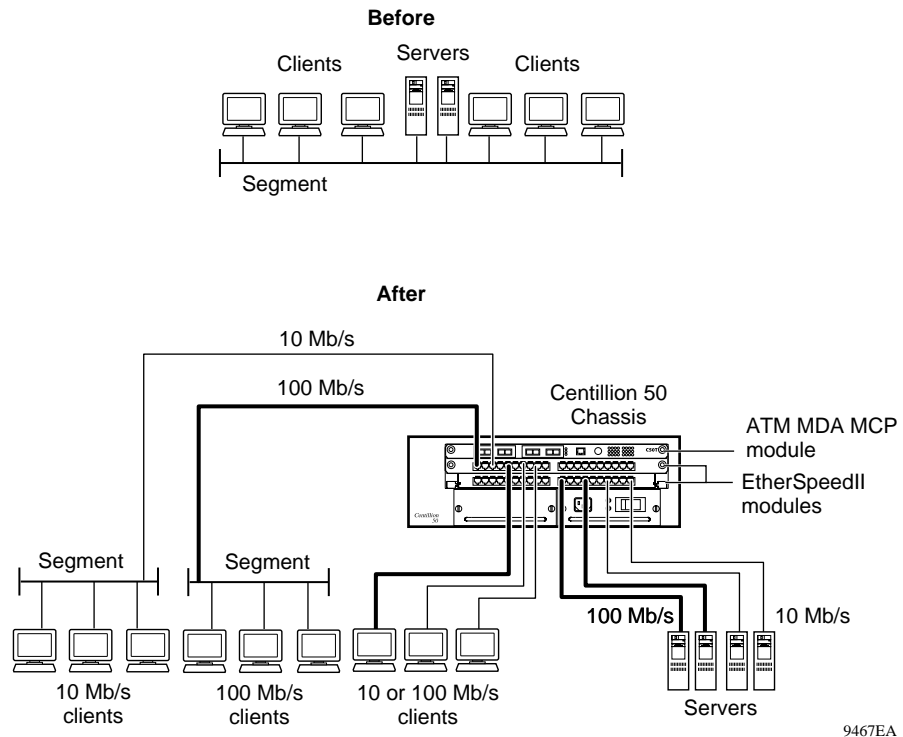
Figure 2-2.   Connecting Servers to Dedicated Ports

Replacing a Bridge

Using a switch instead of a bridge in the network can increase the aggregate network bandwidth. The "After" example in <u>Figure 2-3</u> shows one server connected to a dedicated 10BASE-T port. It also shows the other server and additional clients attached using dedicated 100BASE-TX connections. This network configuration allows you to have switched 10 Mb/s Ethernet along with segmented 10 Mb/s Ethernet to conserve ports.
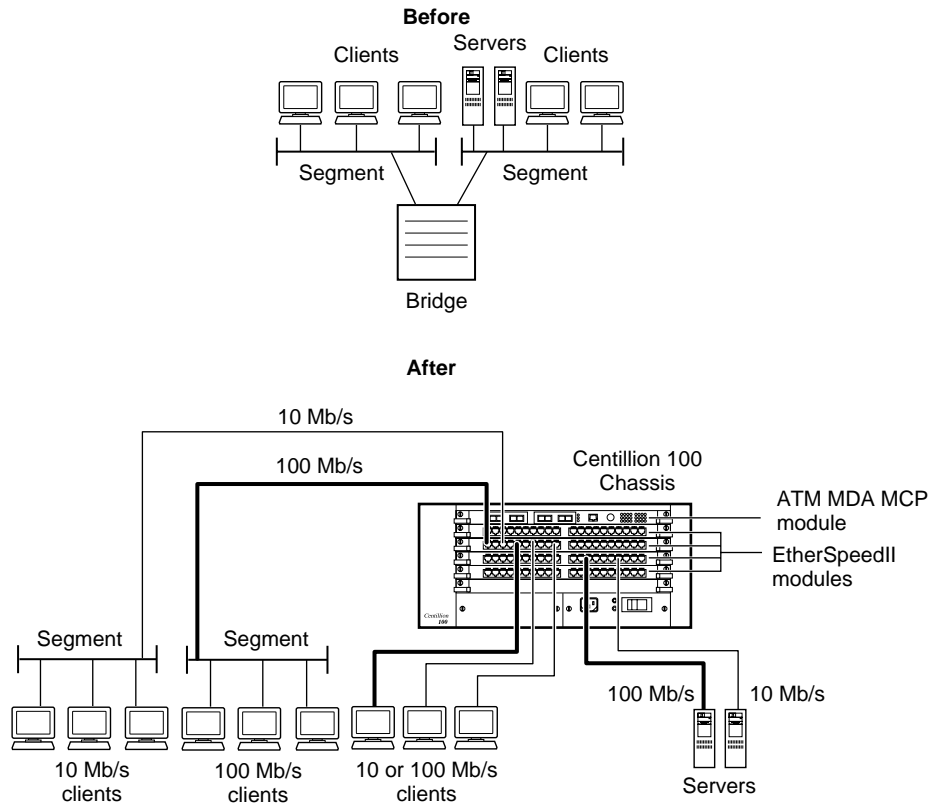

Figure 2-3.   Replacing a Bridge

Desktop Switch with ATM Uplinks

In the example shown in [Figure 2-4](#), the EtherSpeedII 10/100BASE-T switch module provides 20 RJ-45 switched Ethernet (10/100 Mb/s) ports to connect to desktops, with redundant high-speed ATM OC-3c and OC-12c ports to connect to an ATM backbone. This network configuration can support small to large wiring closets.

[Figure 2-4](#) also illustrates a sample network providing ATM uplinks to a Centillion 50/100 chassis. Servers are connected to the network through the Centillion 50/100 chassis, and network stations are connected to the 10/100BASE-T ports on the EtherSpeedII 10/100BASE-T switch modules. The chassis are dual-homed with ATM OC-3c and OC-12c uplinks to the Centillion 50/100 chassis and the Model 5000/5005BH chassis. These chassis can be interconnected with multiple ATM links.
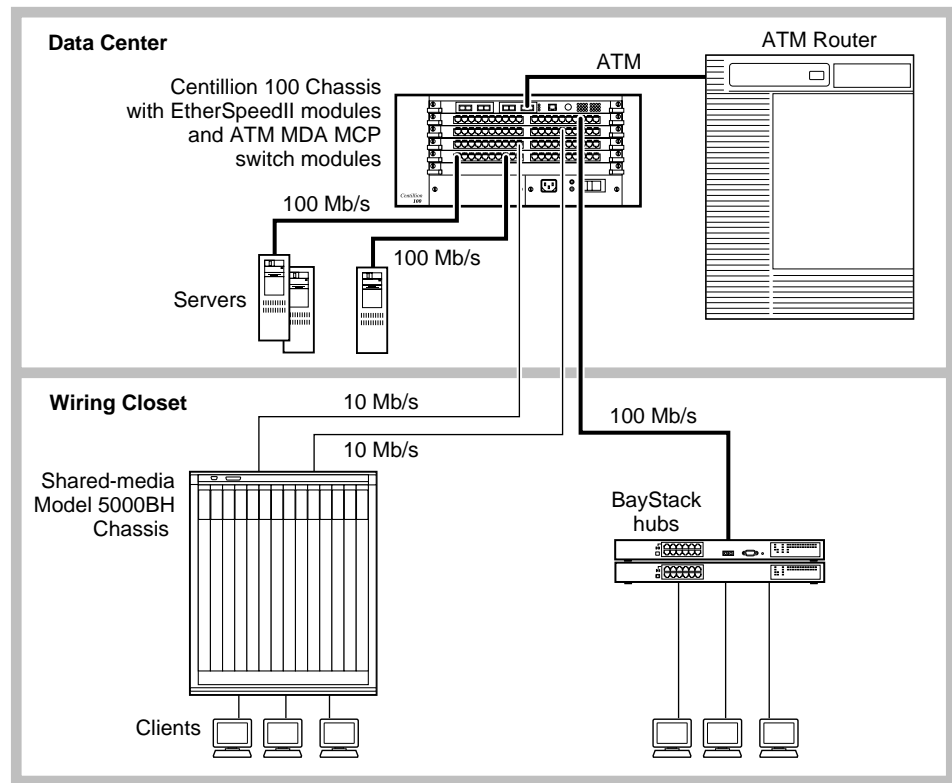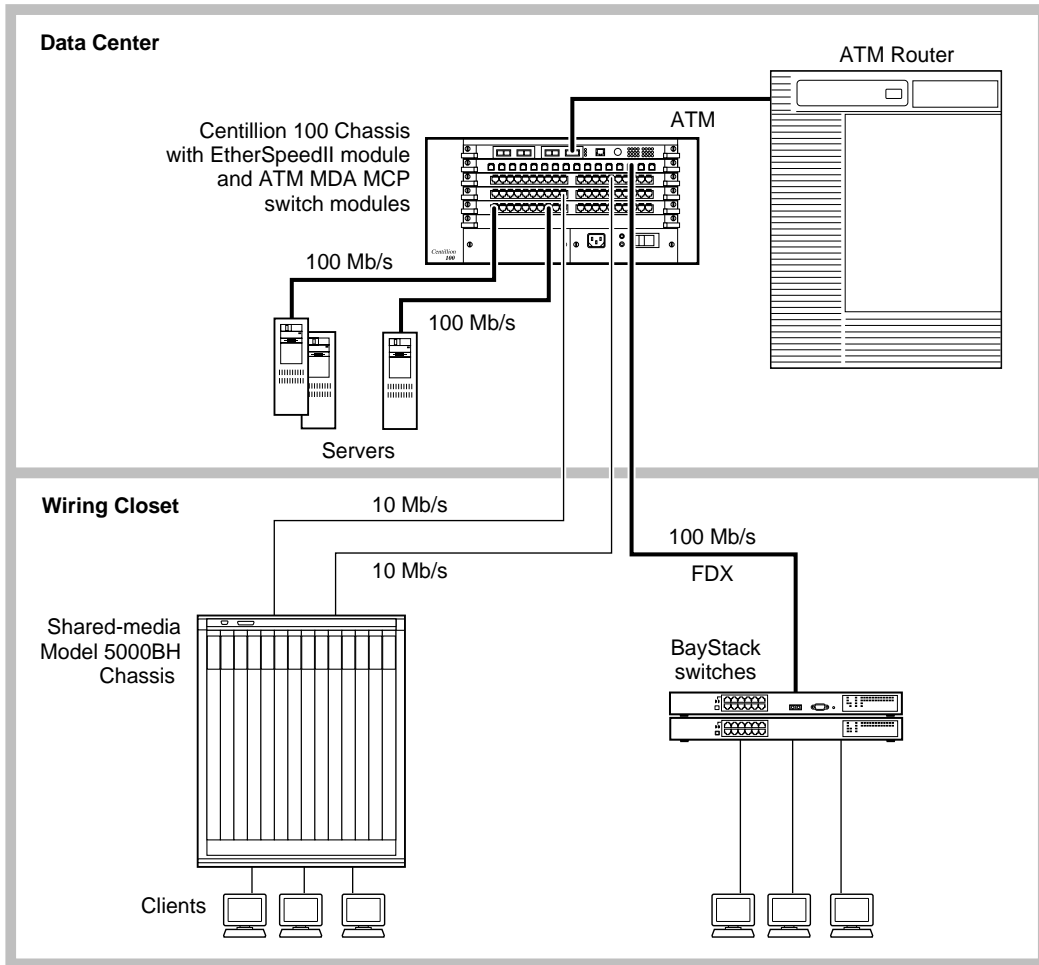

9470EA

Figure 2-4.   Desktop Switch with ATM Uplinks

Segment Switch in an Enterprise Network

To achieve a gradual transition from shared media to switched networks, you can use the EtherSpeedII 10/100BASE-T switch module or the EtherSpeedII 100BASE-FX switch module to aggregate traffic from stations connected to one or more hubs. shows such a network with switches used to connect shared-media hubs to a backbone switch. Stations connected to the EtherSpeedII switch module are associated with different segments through the configuration switching feature.

Data Center

ATM Router

Centillion 100 Chassis with EtherSpeedII module and ATM MDA MCP switch modules

ATM

100 Mb/s

100 Mb/s

Servers

Wiring Closet

10 Mb/s

100 Mb/s

10 Mb/s

FDX

Shared-media Model 5000BH Chassis

BayStack switches

Clients

9470EB

Figure 2-5.   Segment Switch in an Enterprise Network

Desktop Switch and Frame-to-Cell Converter

For wiring closets with higher densities and lower bandwidth requirements, you can use the EtherSpeedII 10/100BASE-T switch module to aggregate traffic from other stackable switch products such as the BayStack™ 301 and BayStack 350T switches (providing frame switching) to an ATM backbone (providing cell switching). The stackable switches and the 20 RJ-45 10/100 Mb/s switched Ethernet ports on the EtherSpeedII 10/100BASE-T switch module provide desktop connectivity.

Figure 2-7 shows a network with EtherSpeedII 10/100BASE-T switch modules used to connect BayStack 301 and BayStack 350T switches to the Centillion 50/100 chassis in a data center. The 10/100 Mb/s ports on the EtherSpeedII switch module provide high-speed connections to the BayStack switches. The EtherSpeedII switch module provides switched 10 Mb/s or 100 Mb/s capability for higher-bandwidth desktop connectivity. You can upgrade to 100 Mb/s with a client NIC upgrade.
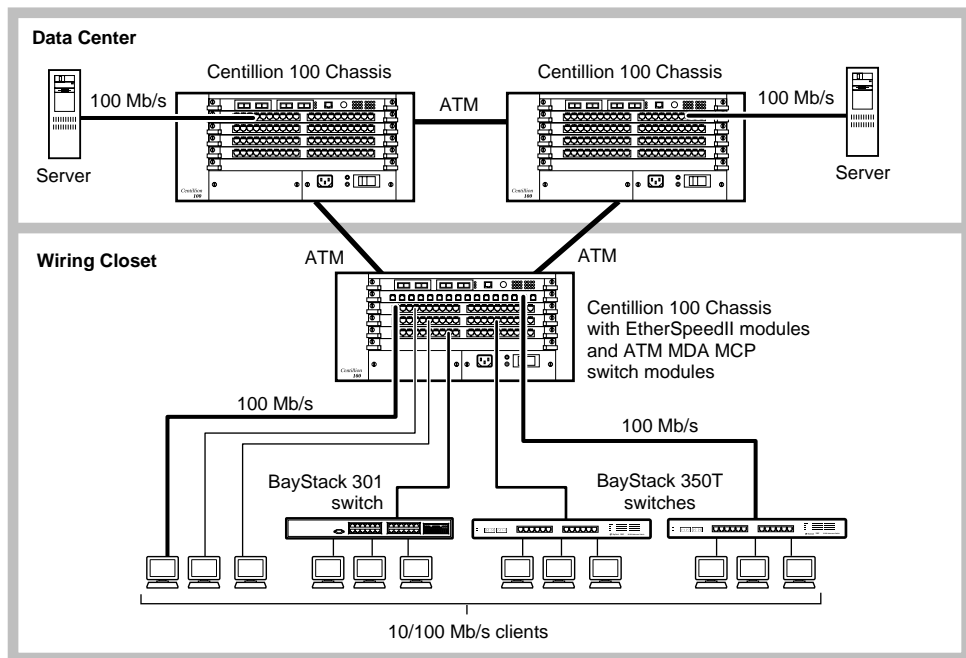

9471EB

Figure 2-6.   Desktop Switch and Frame-to-Cell Converter

MultiLink Trunking

MultiLink Trunking (MLT) allows up to four physical connections for the same media type and speed to be grouped and treated as a single logical link. MLT improves performance between two switches or between a switch and a server. Ports in a single MLT group can span multiple modules.

MLT allows data to be carried over multiple 100 Mb/s full-duplex links connected to the same device, thus improving performance. Figure 2-7 shows that connecting multiple BayStack 450 ports into an EtherSpeedII 10/100BASE-T switch module allows the data load to be shared across multiple ports and multiple boards, improving overall performance. The ability to load share across multiple ports and multiple boards is commonly referred to as distributed MLT.
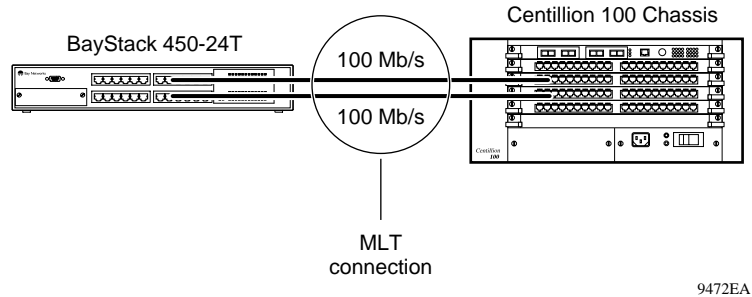
Figure 2-7.   MultiLink Trunking Example

Default Port Configuration

The EtherSpeedII 10/100BASE-T switch module is shipped preconfigured with the factory default settings listed in Table 2-1.

Table 2-1. **Factory Default Settings for the 10/100BASE-T Switch Module**

Parameter	Factory Default	Configurable Options
Switching mode	Transparent	Transparent
Spanning Tree Protocol	None	None, IEEE
Port state	Enable	Enable/Disable
Filters	Disable (none)	Enable/Disable
Port speed	Auto	Auto/10/100
Connection Mode	Auto	Auto/HDX/FDX
Spanning tree group	2	2–32
Priority	128	0–255
Path cost	10	1–65535

The EtherSpeedII 100BASE-FX switch module is shipped preconfigured with the settings listed in Table 2-2.

Table 2-2. **Factory Default Settings for the 100BASE-FX Switch Module**

Parameter	Factory Default	Configurable Options
Switching mode	Transparent	Transparent
Spanning Tree Protocol	None	None, IEEE
Port state	Enable	Enable/Disable
Filters	Disable (none)	Enable/Disable
Spanning tree group	2	2–32
Full/half-duplex setting	FDX	HDX/FDX
Priority	128	0–255
Path cost	10	1–65535

Predefined SpeedView Configurations

SpeedView offers several predefined configurations. You may choose one of these without configuring individual ports. Predefined configurations are available for the following applications:

- All transparent switching with no IEEE 802.1d Spanning Tree support

- All transparent switching with IEEE 802.1d Spanning Tree support

You must enter additional configuration information if you are using any of the following features:

- ATM

- VLANs

- Filtering

- Combinations of bridging modes and Spanning Tree Protocol not offered as defaults

Instructions for using these features are available in *Using SpeedView 4.2 for Windows* and *Release Notes for the Centillion Platform Release 4.1.2*.

Chapter 3
Installing the EtherSpeedII Switch Modules

This chapter explains how to install and connect the EtherSpeedII 10/100BASE-T switch module or the EtherSpeedII 100BASE-FX switch module, and includes the following information and procedures:

- Preparing for installation (this page)

- Installing a switch module ([page 3-2](#))

- Checking LEDs to verify the installation ([page 3-6](#))

- Connecting cables to Model # ports ([page 3-8](#))

- Removing a switch module ([page 3-8](#))

Preparing for Installation

Before you install the EtherSpeedII 10/100BASE-T switch module or the EtherSpeedII 100BASE-FX switch module, make sure that the Centillion 50/100 chassis is assembled and ready to accept modules. For more information, refer to *Installation and Reference for the Centillion 50 and 100 Chassis*.

You need the following tools and materials for installation:

- Medium flat-tip screwdriver for the captive retaining screws

- Grounded antistatic mat and wrist strap

Safety

Always follow static electricity and other safety guidelines when handling EtherSpeedII switch modules.

Caution: Centillion equipment uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can cause damage. Take all possible precautions to prevent static discharge damage when working with printed circuit boards.

Place each module on a grounded antistatic mat until you are ready to install the module. If you do not have an antistatic mat, wear a wrist strap or discharge leash to free yourself of static before touching any of the modules, or free yourself of static by touching the metal chassis before handling the module.

Installing a Switch Module

You can insert or remove a 10/100BASE-T switch module or a 100BASE-FX switch module from a chassis while the power is on without interrupting service in the other modules. This ability is referred to as "hot-swapping."

Note: EtherSpeedII switch modules can be hot-swapped in and out of a chassis at any time. However, before removing an active module from the Centillion 50/100 chassis, either unplug all port cables or disable all ports on the module. This step deactivates the module. For additional information, see .

To install and secure the module in the chassis:

1. **Remove the filler panel.**

    Using the medium flat-tip screwdriver, loosen the two captive retaining screws on the filler panel until they pop free of the chassis. Rotate the left and right inserter/extractor levers away from the center of the filler panel to their protruding positions and remove the filler panel (Figure 3-1).

6463
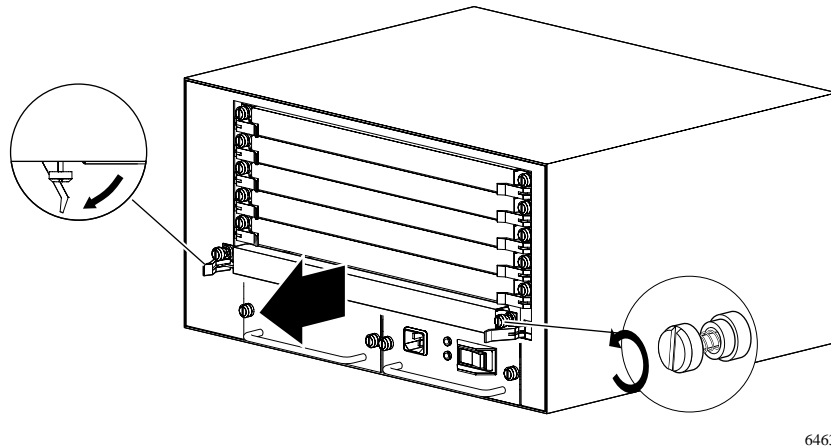
Figure 3-1.   Removing the Filler Panel

2. **Make sure the module inserter/extractor levers are protruding forward (Figure 3-2).**

6464
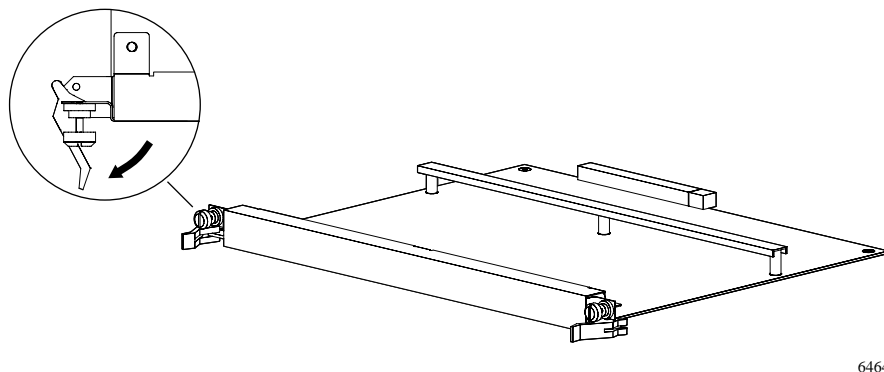
Figure 3-2.   Inserter/Extractor Levers Ready for Installation

3. **Align the left and right edges of the module in the guides on each side of the slot ([Figure 3-3](#)).**
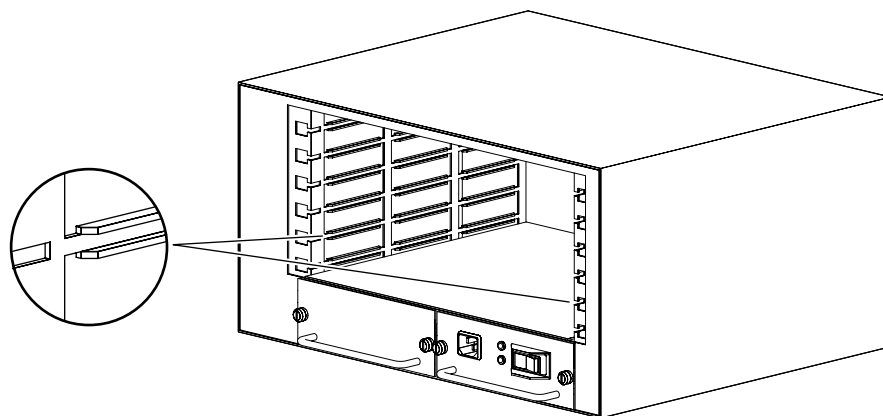
6465

Figure 3-3. **Slot Module Guides**

4. **Slide the module into the chassis until you feel it engage the backplane. The inserter/extractor levers should still be protruding and in contact with the front of the chassis.** *Do not* **push the module all the way into the chassis ([Figure 3-4](#)).**
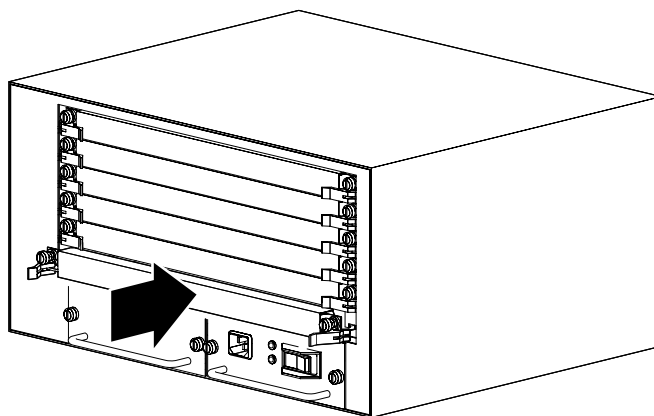
6466

Figure 3-4. **Inserting the Module Until It Engages the Backplane**

5. **To seat the module onto the backplane, push the inserter/extractor levers inward toward the module (Figure 3-5).**

6537FA
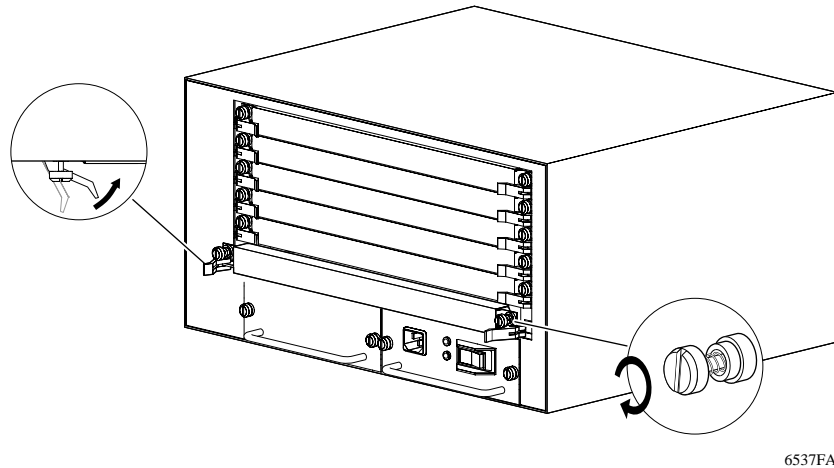
Figure 3-5.   **Seating the Module**

When the front panel of the module is flush with the front of the chassis, the module backplane connectors are properly seated.

6. **Use the flat-tip screwdriver to tighten the captive retaining screw at each end of the module front panel.**

Note: The captive retaining screws on the module must be tightened to at least 2 inch-pounds, but no more than 4 inch-pounds, of torque. Finger tightening is also adequate. Do not overtighten.

Checking LEDs on the Switch Modules

If an EtherSpeedII 10/100BASE-T switch module is installed correctly, upon power-up, all of the LEDs on the front panel light in a sequential pattern. As you connect devices to the switch module's ports, watch the LEDs on the front panel (Figure 3-6). An established link displays the following LED color sequence:

- The LINK LED lights green for each port showing link status.

- The 10/100 LEDs lights green when you have a 100 Mb/s Ethernet connection and is off (no light) when you have a 10 Mb/s connection.

- The 10/100 LED lights amber if a line error is detected. Line errors may be one or more CRC errors, data alignment errors, or frames that are too long.
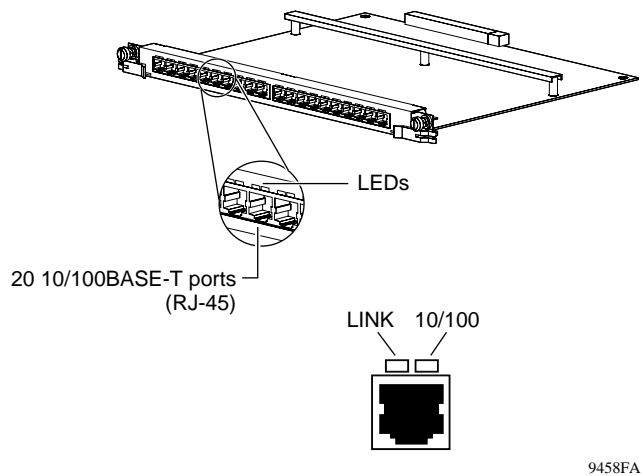
Figure 3-6.   LED Display for the 10/100BASE-T switch module

If an EtherSpeedII 100BASE-FX switch module is installed correctly, upon power-up, all of the LEDs on the front panel light in a sequential pattern. As you connect devices to the switch module's ports, watch the LEDs on the front panel ([Figure 3-7](#)).

• The LINK LED lights green for each port for which a link is established.

• The ERROR LED lights amber if a line error is detected. Line errors may be one or more CRC errors, data alignment errors, or frames that are too long.

9458FB
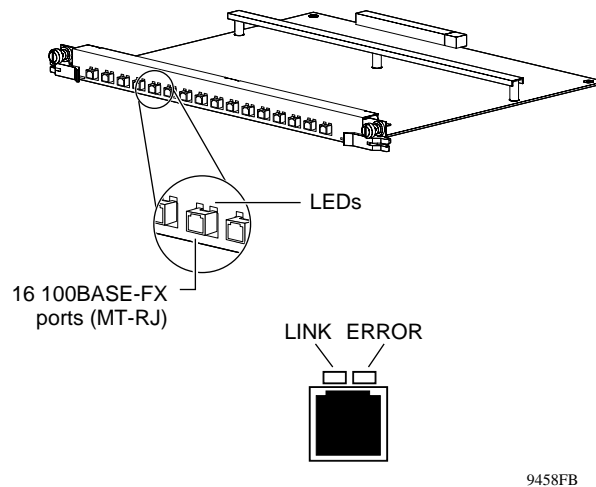
Figure 3-7.   LED Display for the EtherSpeedII 100BASE-FX Switch Module

→ **Note:** See [Appendix C, "LED Displays on the EtherSpeedII Switch Modules,](#)" for a complete description of LED displays for the EtherSpeedII 10/100BASE-T and the EtherSpeedII 100BASE-FX switch modules.

Making 10/100 Mb/s Cable Connections

The 10/100 Mb/s jacks on the EtherSpeedII 10/100BASE-T switch module accept standard UTP or STP cable connections.

To connect network devices to the 10/100 Mb/s ports on the switch module, follow these guidelines:

- Use Category 3 or 5 UTP cable or STP cable with RJ-45 connectors for the ports on the switch module.

- Use straight-through cables to connect the network interface card (NIC) in a PC workstation or server. These devices typically have MDI connectors.

- Use a crossover cable to connect to ports configured as MDI-X (such as Ethernet hubs).

→ **Note:** For more information about cables, connectors, and connector pin assignments, see Appendix B, "Cables and Connectors."

Removing a Module

You can hot-swap a 10/100BASE-T switch module or a 100BASE-FX switch module at any time. However, to remove an active module from the Centillion 50/100 chassis:

1. Disable all ports on the module using SpeedView, or disconnect the cables from each port.

Disabling the ports on a module is described in *Using SpeedView 4.2 for Windows*.

→ **Note:** If the power for the Centillion 50/100 chassis is off, this step is not necessary.

2. **Wait 45 seconds.**

Waiting allows the system software to process the requests to disable the ports.

Caution: If you remove a module without waiting 45 seconds after disabling the ports, you must power cycle the Centillion 50/100 chassis. When you turn off the power on the chassis, you must wait 15 to 20 seconds before turning the power back on. The switch modules begin switching an additional 15 to 20 seconds after power is resumed.

3. **Using the medium flat-tip screwdriver, loosen the two captive retaining screws on the module until they pop free of the chassis.**

4. **Rotate the left and right inserter/extractor levers away from the center of the module to their protruding positions (Figure 3-8).**

The module is disengaged from the backplane.
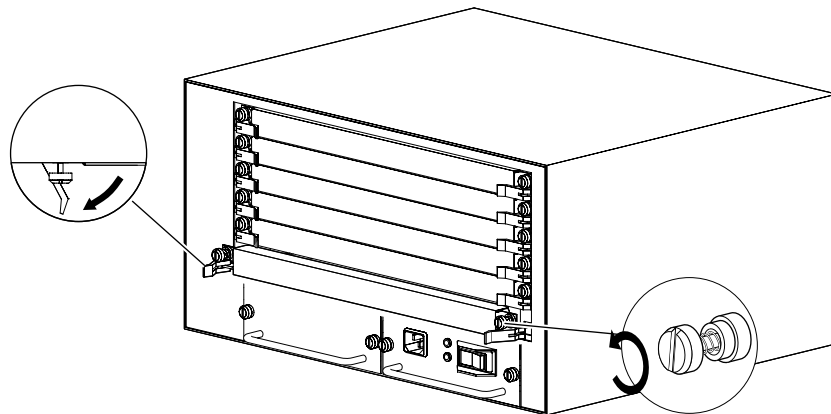
6470

Figure 3-8. **Disengaging the Module**

5. **Slide the switch module out of the chassis (Figure 3-9).**

    Hold the front panel with one hand while you support the bottom of the switch module with the other hand.
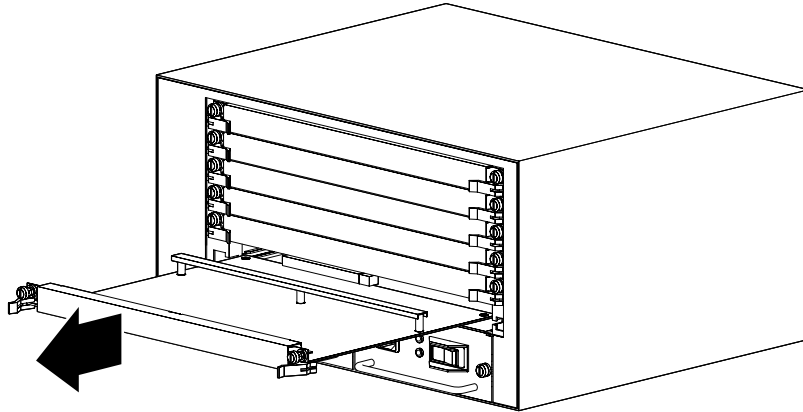
6471

Figure 3-9.   Removing the Module from the Centillion 50/100 Chassis

6. **Place the switch module on an antistatic mat until you are ready to put it back into the chassis.**

7. **If you are not installing another switch module of the same model, install a filler panel over the empty slot.**

Installing the Replacement Switch Module

To install the replacement switch module, follow the procedure described in "Installing a Switch Module" on page 3-2.

Reconfiguring the Replacement Switch Module

The EtherSpeedII 10/100BASE-T and the EtherSpeedII 100BASE-FX switch modules keep the configuration of an identical replacement module. If the replacement is not of the same model type, you must reconfigure the module after it is replaced. Follow the procedure described in "Checking LEDs on the Switch Modules" on page 3-2.

Chapter 4
Troubleshooting

This chapter provides suggestions for troubleshooting problems with the EtherSpeedII 10/100BASE-T switch module or the EtherSpeedII 100BASE-FX switch module and includes the following topics:

- EtherSpeedII switch module startup failure (page 4-2)

- Port connection problems (page 4-3)

To expedite support if you call Nortel Networks, have the following information ready:

- Hardware configuration

- Software configuration (including the image file version number and SpeedView version number)

- Network diagram

- Module or switch part number and serial number for the suspected module

- Brief description of the problem

EtherSpeedII Switch Module Startup Failure

Symptom: All LEDs are solidly lit (do not blink) on the switch module.

To resolve the problem:

1. **Ensure that an MCP module is present and operational with the appropriate version of software.**

   • **The EtherSpeedII 10/100BASE-T switch module requires version 4.1.2 software or greater.**

   • **The EtherSpeedII 100BASE-FX switch module requires version 4.2.1 software or greater.**

2. **Ensure that all modules in the chassis are firmly seated and that the retaining screws have been tightened.**

3. **Remove and reinsert the failing module.**

   If the problem persists, contact the nearest Nortel Networks Technical Solutions Center.

Port Connection Problems

Symptom: The LED on a switch port is off.

If an LED does not light when traffic is present, there may be a port connection problem.

To resolve the problem:

1. **Verify whether or not the port is enabled, using SpeedView or the CLI.**

   a. **From the Map window in SpeedView, choose Switch and then choose Configure.**

      When the configuration information has been downloaded to the management station, check the port state. The port state should be either enabled or disabled.

   b. **From the Map window, choose Statistics.**

      When the statistics information has been downloaded to the management station, check the port state. If the port state is Down, the port is receiving no link signal or is disabled.

   c. **From a configuration terminal connected to the serial port on the switch, access the CLI.**

      Use the **show port** command and specify the module number and port number for the suspected port. When the port information is displayed, verify that port_state is up and that the SPT state is forwarding.

2. **Verify that the cable is correctly connected at both ends of the link.**

   Disconnect and reseat the cable at the switch module port, at the patch panel or punchdown block, and at the device to which the link is attached. Check the port LED for a change in status.

3. **Verify that the port is transmitting and receiving data frames.**

   a. **Check the green RJ-45 LED, which indicates a data exchange.**

      Refer to <u>Appendix C, "LED Displays on the EtherSpeedII Switch Modules</u>," for additional information.

   b. **From the Map window in SpeedView, choose Statistics.**

      When the statistics information is displayed at the management station, verify that the octet counts for transmit and receive are incrementing. Also verify that the frame counts for transmit and receive unicast traffic and for multicast traffic are incrementing.

   c. **From a configuration terminal connected to the serial port on the switch, access the CLI.**

      Use the **show port** command and specify the module number and port number for the suspected port. Verify that the following counters are incrementing:

      - InOctet
      - OutOctet
      - InUcastPkt
      - OutUcastPkt
      - MulticastTransmittedOk
      - MulticastReceivedOk
      - BroadcastTransmittedOk
      - BroadcastReceivedOk

4. **If the port still fails, try inserting it into another switch network or shared segment.**

   If the port functions correctly, check the status of the first switch network or shared segment.

   If the port fails to function, contact the nearest Nortel Networks Technical Solutions Center. Be ready to give the service representative the information listed on <u>page 4-1</u>.

Appendix A
Technical Specifications

This appendix provides technical specifications for the EtherSpeedII switch modules. For connector pin assignments and other information about cables, see Appendix B, "Cables and Connectors."

Industry Protocols and Standards	ISO/IEC 8802-3 (ANSI/IEEE 802.3) Fifth Edition 1996-07-29 Clause 4: Medium Access Control Clause 14: Twisted-Pair Medium Attachment Unit (MAU) and Baseband Medium Type 10BASE-T IEEE Std. 802.3u-1995, Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T (Clauses 21–30)
Interface Options	**EtherSpeedII 10/100BASE-T switch module:** RJ-45 copper, twisted-pair connectors (8-pin modular) **EtherSpeedII 100BASE-FX switch module:** MT-RJ fiber-optic connectors
Data Rates	**EtherSpeedII 10/100BASE-T switch module:** 10/100 Mb/s switched Ethernet **EtherSpeedII 100BASE-FX switch module:** 100 Mb/s switched Ethernet
Autonegotiating Features	**EtherSpeedII 10/100BASE-T switch module:** 10/100 Mb/s speed autonegotiation
Microprocessor	64-bit MIPS 5000 series processor, 200 MHz per module

Memory

Processing Dynamically Allocated	8 MB
Buffer Pool	16 MB
CAM (Content Addressable Memory)	8,192 entries

Electrical Specifications

Power Consumption	52 W (max)
Thermal Rating	194.5 BTU/hr (max)

Physical Specifications

Dimensions	(L) 10.5 in. x (W) 12.25 in. x (H) 1.0 in.
	[(L) 26.7 cm x (W) 31.7 cm x (H) 2.5 cm
Weight	Module alone: 2.5 lbs (1.1 kg)

Environmental Specifications

Operating Temperature	5° to 40° C (ambient)
Storage Temperature	-25° to 70° C (ambient)
Operating Humidity	85% maximum relative humidity, noncondensing
Storage Humidity	95% maximum relative humidity, noncondensing
Operating Altitude	10,000 ft (3,000 m) max
Free Fall/Drop	ISO 4180-s, NSTA 1A
Vibration	IEC 68-2-6/34
Shock/Bump	IEC 68-2-27-29

Electromagnetic Emissions

Meets requirements of:
FCC Part 15, Subpart B, Class A
EN 55 022 (CISPR 22:1985), Class A
VCCI Class 1 ITE

Electromagnetic Susceptibility

Electrostatic Discharge (ESD)	EC 801-2, Level 2
Radiated Electromagnetic Field	EC 801-2, Level 2, EC 801-4, Level 2
Electrical Fast Transient Burst	IEC 801-5, Levels 1 and 2
Electrical Surge	Complies with EN 50082-1 (European CE mark requirements)

Safety Agency Approvals

International Electrical Code of 950 (IEC 950)
Underwriters Laboratories (UL 1950)
Canadian Standards Association (C22.2 No. 950) or
Bi-national Standard (UL1950 and C22.2 No. 950)
equivalent to UL and cUL
European Union (EN60950)
Norma Oficial Mexicana (NOM-19-SCFI)
Meets UL-94-V1 (PWB) flammability requirements

Mean Time Between Failure (MTBF)	177,000 hours
Cabling Specifications	**EtherSpeedII 10/100BASE-T switch module:** Types: Category 3 or 5 unshielded twisted pair (UTP) or shielded twisted pair (STP) **Note:** You can use Category 3 UTP cable only for 10 Mb/s port operation, not for 100 Mb/s or 10/100 Mb/s autonegotiating port operation where the negotiated rate may be 100 Mb/s. -Maximum Length: 100 meters (cable plant and patch — cables inclusive) -Connector Types: Shielded RJ-45 connectors **EtherSpeedII 100BASE-FX switch module:** • MT-RJ to SC: Nortel Networks Part No. AA0018032 • MT-RJ to ST: Nortel Networks Part No. AA0018033 • MT-RJ to MT-RJ: Nortel Networks Part No. AA0018034

*See the disclaimer on page ii of this manual.

Appendix B
Cables and Connectors

This appendix provides general information about 10BASE-T and 100BASE-TX cabling and connections.

UTP Cable Length Limitations

All 10BASE-T/100BASE-T ports on EtherSpeedII switch modules support the maximum lengths for twisted pair cable that are specified in the IEEE 802.3 10BASE-T/100BASE-TX Ethernet specification. This specification defines the maximum segment length in terms of the performance characteristics of the cable media, which can vary according to cable type. In most networks, cable runs are less than 100 meters (m) to ensure that data is not distorted or lost.

For UTP links of #24 AWG cable between a network interface (transceiver or 10BASE-T/100BASE-TX network interface card) and a hub or between hubs, these performance specifications are normally met by a cable run of 100 m (330 ft.) or less, including any patch cables and cross-connect cables. The 10BASE-T/100BASE-TX standard specifies this length as a design objective. The EtherSpeedII switch module is designed to support a maximum cable length of 100 m.

Your cable plant can contain Category 3 or 5 UTP cables, up to a maximum length of 100 m between the end station and the switch module. Use an appropriate patch cable to connect your cable to this module.

UTP Cabling

A 10BASE-T/100BASE-TX connection between two ports requires two twisted pairs. The transmit data (TD) pair carries data out from the port transmitter. The receive data (RD) pair carries data in to the port receiver.

The 10BASE-T/100BASE-TX TD and RD circuits must be connected as follows:

- Individual conductors must provide pin-to-pin continuity (TD+ to RD+, TD- to RD-, and so on) between the EtherSpeedII switch module port and the attached MDI port on a transceiver or other network interface.

- Each signal circuit must use a single twisted pair throughout the link.

- Standard Ethernet patch panels and cables provide the previous features.

10BASE-T/100BASE-TX MDI Ports and MDI-X Ports

In the 10BASE-T/100BASE-TX standard, MDI is the electrical and mechanical interface specified for the 10BASE-T/100BASE-TX transceiver or network interface card connector (for example, on the station at the end of a link). MDI port pins 1 and 2 carry the transmit (TD) signal, and pins 3 and 6 carry the receive (RD) signal as shown in Figure B-1.
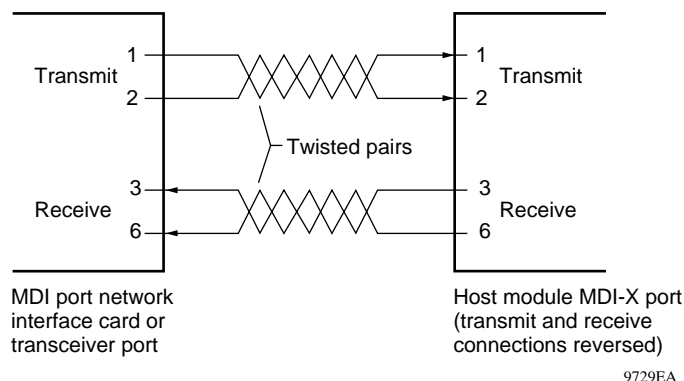
Figure B-1.   MDI-X Internal Crossover (RJ-45 Example)

The switch module receives data on pins 1 and 2 and transmits its data on pins 3 and 6. The host module ports implement this MDI standard crossover internally and are called MDI-X (the X for crossover), as shown in Figure B-1. All EtherSpeedII switch module 10BASE-T ports are MDI-X standard.

Two simple rules govern all usual RJ-45 connections from each switch module 10BASE-T/100BASE-TX port to the 10BASE-T/100BASE-TX port on another device:

- A straight-through cable (MDI to MDI-X) is customarily used for connection to a station NIC, to a transceiver, or to a cable plant patch panel.

- A crossover cable or adapter (MDI-X to MDI-X; as shown in Figure B-2) is customarily used for connection to another switch or hub port.
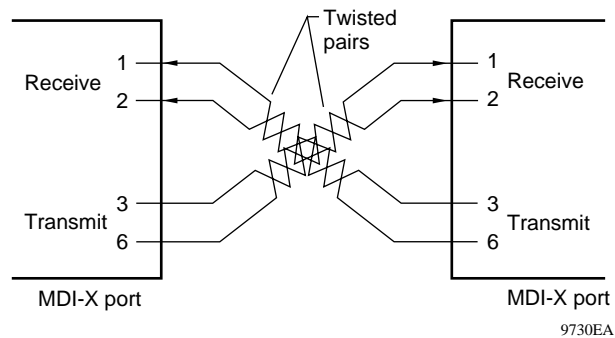
Figure B-2.   MDI-X to MDI-X External Crossover (RJ-45 Example)

Making the crossover externally with a crossover cable or adapter that exchanges the TD and RD wire pairs (as shown in Figure B-2) is possible but has the following disadvantages:

- A crossover cable is not standard. You may need to special order one or make your own.

- Crossover cables and standard cables that resemble one another in a network can cause confusion.

Caution: Make any crossover cable you use look obviously different from normal straight-through cables and put a tag on each end; for example, use a distinctive color like yellow and put a tag labeled "X-over" on each end.

Figure B-3 illustrates an MT-RJ connector.

9721FA
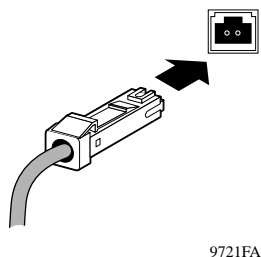
Figure B-3.   MT-RJ Connector

Table B-1 lists the optical specifications for multimode fiber.

Table B-1.   Optical Specifications for Multimode Fiber Optic Cable

Description	Specification
Fiber Type	Duplex 62.5/125-micron fiber
Connector type	MT-RJ
Link budget	6 dB
Maximum run length in full-duplex mode	2000 meters
Maximum run length in half-duplex mode	412 meters

Table B-2 lists the specifications for multimode fiber.

Table B-2.   Specifications for Multimode Fiber Optic Transceivers

Description	Specification
LED	1310 nm
Fiber Type	Duplex 62.5/125-micron fiber
Mean launched power	-20 to -14 dBm
Minimum receive sensitivity	-26 dBm

UTP Cables and Connectors

Table B-3 shows the pin assignments for 10BASE-T/100BASE-TX ports in the standard MDI-X configuration.

Table B-3.   10BASE-T/100BASE-TX MDI-X Port Pin Assignments

RJ-45 Connector Port	Pin #	MDI-X Ports
	1	Receive data +
	2	Receive data −
	3	Transmit data +
	4	Not used
	5	Not used
	6	Transmit data −
	7	Not used
	8	Not used

1 2 3 4 5 6 7 8

9475EA

Figure B-4 shows a 10BASE-T/100BASE-TX Ethernet UTP crossover cable used to connect an Ethernet hub directly to the EtherSpeedII switch module.

```
RD+    1 ─────────────┐   ┌───────────── 1  RD+
RD-    2 ───────────┐ │   │ ┌─────────── 2  RD-
TD+    3 ───────────┼─┼───┼─┘ ─────────── 3  TD+
Unused 4 - - - - - -│-│- -│- - - - - - -- 4  Unused
Unused 5 - - - - - -│-│- -│- - - - - - -- 5  Unused
TD-    6 ───────────┘ └───┘ ─────────── 6  TD-
Unused 7 - - - - - - - - - - - - - - - -- 7  Unused
Unused 8 - - - - - - - - - - - - - - - -- 8  Unused
```

6740.2
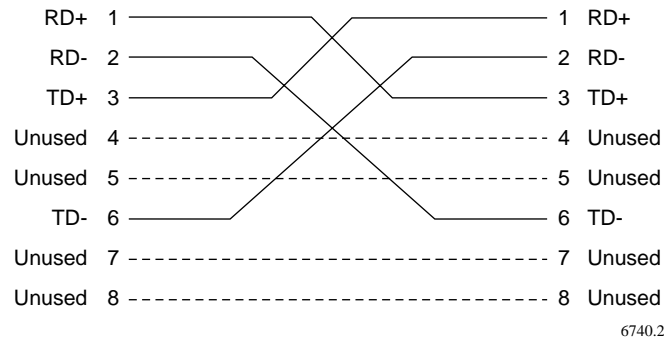
Figure B-4.   10BASE-T/100BASE-TX Ethernet UTP Crossover Cable

Pin 1 crosses to pin 3, and pin 2 crosses to pin 6. To build this cable, you must cross pairs. The pairs are listed in Table B-4, with an example of the color combinations found in two typical cables.

Table B-4. **Pairs in an RJ-45 Crossover Cable**

Pairs	Example 1 Color Combinations	Example 2 Color Combinations
1 and 2	Orange/white and white/orange	Orange and blue
3 and 6	Green/white and white/green	Yellow and black
4 and 5	Blue/white and white/blue	Red and green
7 and 8	Brown/white and white/brown	Brown and gray

Using Category 5 Unshielded Twisted Pair Cables

Unshielded twisted pair (UTP) cable is the recommended wiring option for 100BASE-TX Fast Ethernet, as specified in the IEEE 802.3 standard for Ethernet. Fast Ethernet recommended UTP cable consists of four pairs of twisted insulated copper conductors bound in a single plastic sheath. The 100BASE-TX Fast Ethernet transmissions are implemented through two-pair or four-pair Category 5 UTP wiring using standard shielded RJ-45 connectors. Category 5 cable is certified to handle up to 100 MHz bandwidth. The EIA/TIA T568A standard recommends the installation of Category 5 UTP cable for 100 Mb/s networks.

Use the following guidelines to ensure that your cables perform to specifications:

• *Certification*—Make sure that your Category 5 UTP cable has completed the Underwriters Laboratories (UL) or Electronic Testing Laboratories (ETL) certification process.

• *Terminating method*—To minimize crosstalk noise, maintain the twist ratio of the cable up to the point of termination (untwist at any termination should not exceed 0.5 in.).

• *Pairing options*—For optimal performance from your cable plant, use the EIA-T568A Commercial Building Wiring Standard pairing option at each end of the cable. The terminating hardware offered by most major manufacturers is correctly color-coded for proper wire placement according to that standard.

Using Shielded Twisted Pair Cables

Type 1 shielded twisted pair (STP) cabling also operates with 10BASE-T Ethernet and 100BASE-TX Fast Ethernet. Type 1 STP cable consists of tinned-copper braided shield surrounding two data-grade twisted pairs of #22 AWG solid copper conductors that have individual or S-shaped shields of aluminum-backed insulating tape or metallized Mylar foil.

➡ **Note:** A balanced unbalanced (balun) media adapter is required when connecting 100-ohm RJ-45 100BASE-TX ports to a 150-ohm STP cable plant. This adapter provides impedance matching between UTP (100-ohm) and STP (150-ohm) cabling.

Type 1 cable generally is used between wiring closets or from the wiring closet patch panel to the work area wall outlet.

Type 1 cable generally is terminated with an IBM four-position data connector. Nortel Networks Fast Ethernet supports 100BASE-TX Fast Ethernet over STP media through the application of a specialized balun media adapter, also referred to as a Type 1 balun (Figure B-5). When adapting 150-ohm STP cable plants for Fast Ethernet applications, balun media adapters are required at both the hub and station ends of the STP cable plant. Media adapters (such as AMP part number 558421-1) are available that plug into the RJ-45 patch cable connectors, allowing the patch cable to connect with an IBM data connector. The media adapter and patch cable provide impedance matching between UTP (100-ohm) and STP (150-ohm) cabling.
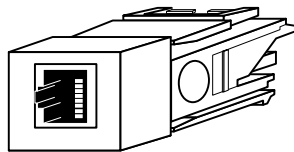
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Figure B-5.   Fast Ethernet Type 1 Balun Media Adapter

➡ **Note:** For additional information about AMP Type 1 balun media adapters (part number 558421-1), contact your AMP reseller or distributor. The user should verify that the combination of the STP cable plant and the impedance-matching baluns meets the requirements of the applicable LAN standard.

Appendix C
LED Displays on the
EtherSpeedII Switch Modules

This appendix describes the LED displays for the Centillion EtherSpeedII 10/100BASE-T 20-Port switch module and the Centillion EtherSpeedII 100BASE-FX 16-Port switch module.

The EtherSpeedII 10/100BASE-T switch module LED display (Figure C-1) consists of two LEDs for each port. The LEDs indicate specific operating status.
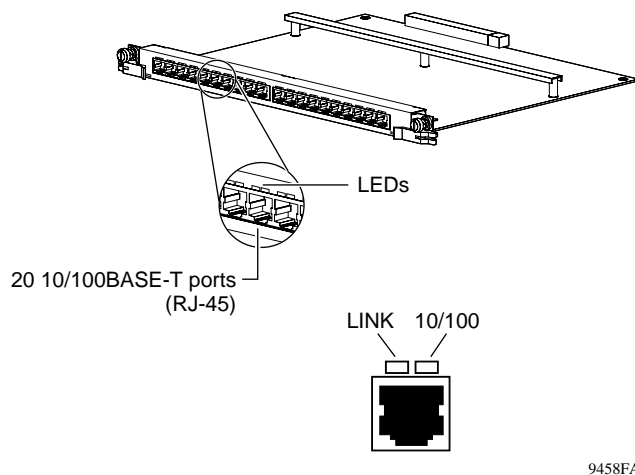
Figure C-1.   **LED Display for the EtherSpeedII 10/100BASE-T Switch Module**

Table C-1 describes the operating conditions that cause the LEDs to light on the switch module.

Table C-1.   LEDs on the EtherSpeedII 10/100BASE-T Switch Module

Label	Color/Status	Meaning
LINK (port status)	Green	Link present
	Yellow	TX/RX activity
	Off	No link established
10/100 (port speed)	Off	Port operating at 10 Mb/s
	Green	Port operating at 100 Mb/s
	Amber	Line error
		The port speed LED illuminates amber for the following reasons: • Frame too long • CRC errors • Alignment errors • Transmit and receive collisions (HDX mode)

The EtherSpeedII 100BASE-FX switch module LED display (Figure C-2) consists of two LEDs for each port. The LEDs indicate specific operating status.
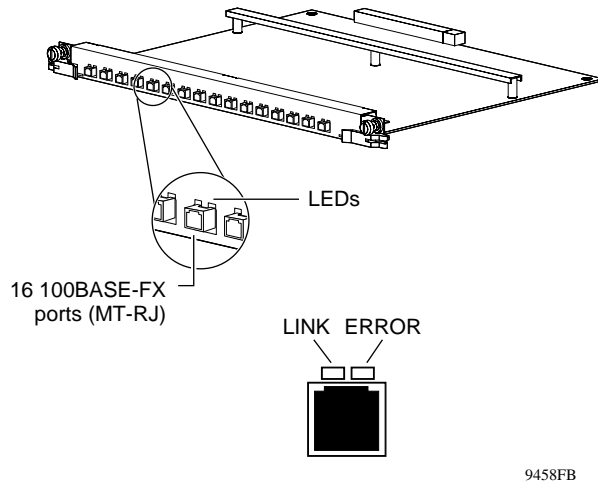
Figure C-2. **MT-RJ LEDs for the EtherSpeedII 100BASE-FX Switch Module**

Table C-2 describes the operating conditions that cause the LEDs to light on the switch module.

Table C-2.   LEDs on the EtherSpeedII 100BASE-FX Switch Module

Label	Color/Status	Meaning
LINK (port status)	Green	Link present
	Yellow	TX/RX activity
	Off	No link established
ERROR	Amber	Line error
		This port speed LED illuminates amber for the following reasons:
		• Frame too long • CRC errors • Alignment errors • Transmit and receive collisions (HDX mode)

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